

the same vessel, in N. 49° 06', W. 30° 39', encountered nw. gale, force 9. On the same day, the s. s. "Arizona," near N. 50°, W. 30', reported barometer 29.15; wind suddenly shifted from s. by w., force 3, to n. by w., force 9, with high cross sea, one sea coming from the west, and another from the north. The gale lasted about fourteen hours, with very hard squalls.

Captain C. Ludwig, commanding the s. s. "Westphalia," furnishes the following: 17th, in N. 50° 57', W. 24° 50', barometer 29.19, falling; the wind went slowly but steadily to south, and, between noon and 4 p. m., it passed through east to north, slowly increasing, and accompanied by heavy rains. At 4 p. m., the barometer read 28.78, and between 5 and 6 p. m. the gale broke suddenly out from the nw., force 11; at the same time the sea-swell rose from moderate to very heavy. The gale continued, with very high sea and rain, and totally clouded sky, until 10 p. m. After that hour the sky began to clear, while the wind increased to force 10, at 11 p. m. At midnight, the barometer began to rise, but very heavy squalls of force 11, continued, without rain, until 4 a. m. of the 18th. The s. s. "Colima," in N. 52° 12', W. 28° 11', reported: 9.30 p. m., barometer 28.74, wind n. $\frac{1}{2}$ e., force 11, with heavy rain; at 10 p. m., wind ne. by n., force 12, raining, barometer 28.55. On the 19th, 4 a. m., barometer 28.46, wind nw.; force 10.

VII.—This depression formed in western Nebraska, on the 11th, and pursued rather an erratic course. At first the movement was to the northeast, changing to the northwest, and recurving, on the 12th, west of Manitoba; after this, its course was about east-southeast. On the morning of the 13th, the centre was north of Lake Superior. During the afternoon, the course was again changed. It now began to move toward the northeast, and passed the limits of observation. The lowest pressure observed was 29.23, on the 12th, at Fort Garry, Manitoba. At nearly every station in the upper lake region, the wind reached a velocity of more than twenty-five miles. Rain fell, during its passage, in Montana, Dakota, the Missouri and Mississippi valleys, and the lake region.

VIII.—This depression made its appearance in Colorado, on the 14th, and moving in a direction nearly northeasterly, passed into British America, on the 15th. The lowest pressure observed was 29.34, at Fort Garry, Manitoba, on the 15th.

IX.—On the morning of the 19th, the reports showed that a depression was moving across British America, the centre at that time being some distance north of Montana. By the 20th, it had disappeared. The disturbance was so slightly felt in the United States that a description is considered unnecessary.

X.—On the morning of the 21st, a sharp fall occurred in Dakota. The depression thus formed, moved in a direction north of east; the centre passed over Minnesota, Lake Superior, and Canada, and disappeared, on the 23d. Rain occurred in the northern Mississippi valley, the lake region, and the New England states. The lowest observed pressure was 29.70, at Escanaba, on the 22d. The wind reached a velocity of more than twenty-five miles at Duluth, Minnesota, Marquette and Escanaba, Michigan.

XI.—This depression formed in British America, north of Montana, and was first noted on the morning of the 24th. The movement was to the southeast till midnight, the centre then being at Duluth, Minnesota. From this point the course was to the north of east. Following the Saint Lawrence river, it passed into the Atlantic, on the 26th. The lowest observed pressure was 29.24, at Sydney, Cape Breton Island, on the 25th. Light rains occurred in Canada and the New England states.

XII.—This area made its appearance on the coast of British Columbia, on the 26th. The centre moved across British America, pursuing an easterly course, and passed into the Atlantic, on the 30th. The lowest pressure observed was 29.40, at Fort Garry, Manitoba, on the 27th.

XIII.—This depression was first noted in Montana, on the 29th, though it is evident that a disturbance existed in British Columbia, on the 28th. The movement was southerly until the morning of the 30th, the centre then being in southern

Dakota. The course changed to the northeast, and the last trace had of it was at Cape Rozier, province of Quebec, on the 31st. The lowest observed pressure was 29.40, at Marquette, Michigan, on the 30th. Light rains occurred in Montana, Dakota, the Missouri and Mississippi valleys, the lake region, and the New England states.

INTERNATIONAL METEOROLOGY.

International charts iv. and v. accompany the present number of this REVIEW. Chart iv. is published for August, 1880, and continues the series of that chart begun in January, 1877. Chart v. is prepared for November, 1880, and continues the series of that chart begun November, 1877. For the description of these charts, much valuable information has been obtained from the "Monatliche Uebersicht der Witterung," published by Professor Dr. G. Neumayer, Director of the German Marine Observatory at Hamburg, and from the "Bulletin Mensuel," published by Mr. Marc Dechrezens, of Zi-Ka-Wei, China.

Chart iv. exhibits the mean pressure, mean temperature, and the prevailing direction of the wind over the northern hemisphere, and at certain isolated stations in the southern hemisphere, as determined from one observation taken each day at 7:35 a. m. Washington, or 0.43 p. m. Greenwich mean time.

The mean pressure is lowest over the continent of Asia, where it ranges from 29.50 (749.3) over British India, to 29.80 (756.9) in Siberia, and in China and Japan.

An area of low-pressure, 29.80 (756.9), occupies Iceland, and extends, with decreasing pressure, westward over Greenland, where the mean pressure for the month is 29.58 (751.3) at Godthaab.

The isobar of 29.90 (759.4) covers the Gulf of Saint Lawrence, and extends northeastward, over the ocean, to the extreme northern limits of Scandinavia; it then trends south-westward and occupies southeastern Europe.

The area of highest mean pressure 30.20 (767.1) is shown over the Azores, while high-pressures, 30.00 (762.0) to 30.10 (764.5), occupy the North American continent, the Atlantic ocean and western Europe. In the United States, the area of barometric maxima covers the north Pacific coast, where the mean pressure ranges from 30.00 (762.0) to 30.06 (763.5).

Compared with the preceding month (July), the mean atmospheric pressure has increased over the United States, except in southern California and the Florida peninsula, where a slight decrease has occurred. In Canada, there is a general increase of pressure throughout the Dominion.

In Europe, the mean barometric pressure has increased considerably in the northern and northwestern parts of the continent; the largest increase appears over the British Isles and the Scandinavian peninsula.

In central Europe, the pressure has remained unchanged, and in the southern peninsulas, a slight decrease is shown.

In Greenland, the pressure has materially decreased, the mean pressure at Godthaab being .23 inch below that of July, 1880.

In Morocco, Algeria, and Tunis, the pressure has decreased about .05 inch.

In Asia, the changes are unimportant, except over the region lying north of the fiftieth parallel, where there is an increase of .07 inch.

Compared with the corresponding month of previous years, the mean pressure is above the normal along the Atlantic coast of the United States, and westward to the eighty-fifth meridian. In the interior, the Florida peninsula, and over the Gulf of Mexico, the pressure is below the normal, the greatest deficiency, .07 inch, being reported from Florida. In Canada, the pressure is above the normal.

The following table shows the mean pressure and mean temperature, with corresponding departures, for the month of August, 1880, in the several countries of Europe and Asia, compared with the means as determined from observations taken during the years 1877, 1878, and 1879:

Countries.	Mean Pressure.			Mean Temperature.		
	August, 1877, 1878 and 1879.	August, 1880.	Depart- ure.	August, 1877, 1878 and 1879.	August, 1880.	Depart- ure.
Algeria.....	30.01	29.95	-0.06	89.4	89.3	+ 0.1
Austria.....	29.96	29.87	-0.09	75.3	71.1	- 4.2
British Isles.....	29.78	30.01	+0.23	62.4	66.5	+ 4.1
Denmark.....	29.80	29.98	+0.18	64.3	68.7	+ 4.4
France.....	29.94	29.96	+0.01	75.0	73.8	- 1.2
Germany.....	29.91	29.95	+0.04	70.1	70.5	+ 0.4
India.....	29.61	29.63	+0.02	82.6	83.0	+ 0.4
Italy.....	29.95	29.89	-0.06	83.2	78.0	- 5.2
Norway.....	29.78	29.99	+0.21	63.3	67.0	+ 3.7
Portugal.....	30.01	29.97	-0.04	80.8	78.0	- 2.8
Russia.....	29.85	29.86	+0.01	70.7	73.4	+ 2.7
Spain.....	29.95*	29.93	-0.02	81.7*	80.0	- 1.7
Sweden.....	29.81	29.97	+0.16	63.7	69.3	+ 5.6

* Mean for two years only.

The accompanying table shows the deviations in pressure and temperature at isolated stations during the month of August, 1880, as compared with the means of three years:

Comparative Thermometric and Barometric Means, with corresponding Departures.

STATION.	Mean Pressure.			Mean Temperature.		
	August, 1877-78-79.	August, 1880.	Departure.	August, 1877-78-79.	August, 1880.	Departure.
San José, Costa Rica, C. A.....	29.96	29.95	-0.01	86.3	86.4	+ 0.1
Hibralar.....	29.96	29.95	-0.01	79.9	78.0	- 1.9
Malta, Mediterranean Sea.....	29.95	29.90	-0.05	84.4	83.8	- 0.6
Sandwich Manse, Orkney Islands.....	29.76	30.04	+0.28	56.7	61.1	+ 4.4
Bridgetown, Barbadoes.....	29.99	29.97	-0.02	84.2	81.3	- 2.9
Cape Town, Cape Good Hope.....	30.19	30.10	-0.09	60.6	61.8	+ 1.2
Fort Napier, Natal, South Africa.....	30.02	29.91	-0.11	69.3	72.4	+ 3.1
Freetown, Sierra Leone.....	30.00	29.97	-0.03	79.8	83.6	+ 3.8
Mauritius, Indian Ocean.....	30.18	30.20	+0.02	71.8	71.2	- 0.6
Melbourne, New South Wales.....	30.11	29.99	-0.12	49.9	51.5	+ 1.6
Nassau, Bahamas.....	30.01	30.00	-0.01	84.2	82.7	- 1.5
Godthaab, Greenland.....	29.86	29.58	-0.28	45.7
Stykkisholm, Iceland.....	29.86	29.72	-0.14	51.7	56.1	+ 4.4
Thorshavn, Faroe Islands.....	29.83	29.95	+0.12	51.9	57.9	+ 6.0
Fort-de-France, Martinique.....	29.84	30.15	+0.31	80.2	78.3	- 0.9
Zi-Ka-Wei, China.....	29.81	29.74	-0.07	77.4	73.9	- 3.5
Athens, Greece.....	29.89	29.85	-0.04	88.1	85.6	- 2.5
Lahore, British India.....	29.49	29.48	-0.01	98.9	96.1	- 2.8
Cagliari, Sardinia, Italy.....	29.94	29.89	-0.05	85.1	82.2	- 2.9
Tokai, Japan.....	29.85	29.83	-0.02	76.1	75.1	- 1.0
Tromsø, Norway.....	29.78	29.88	+0.10	62.8	65.6	+ 2.8
Angra, Azores.....	30.10	30.26	+0.16	72.9	73.4	+ 0.5
Funchal, Madeira Islands.....	30.10	30.10	normal	76.3	75.8	- 0.5
Ponta Delgado, Azores.....	30.13	30.21	+0.08	76.2	74.8	- 1.4
Archangel, Russia.....	29.76	29.91	+0.15	58.8	64.8	+ 6.0
Tiflis, Russia.....	29.79	29.75	-0.04	84.1	87.1	+ 3.0
Astrakhan, Russia.....	29.56	29.85	+0.29	79.9	83.3	+ 3.4
Ekaterrinburg, Russia.....	29.73	29.81	+0.08	65.8	68.2	+ 2.4
Nukuss, Toorkistan, Asia.....	29.75	29.77	+0.02	85.1	83.7	- 1.4
Tashkend, Toorkistan, Asia.....	29.78	29.70	-0.08	81.8	81.9	+ 0.1
Barnaul, Siberia, Asia.....	29.74	29.72	-0.02	67.7	66.0	- 1.7
Yeniseisk, Siberia, Asia.....	29.75	29.83	+0.08	64.0	64.8	+ 0.8
Pekin, China.....	29.76	29.75	-0.01	76.9	78.3	+ 0.9
Nikolajevsk on the Amoor, Asia.....	29.76	29.75	-0.01	58.0
San Juan de Puerto Rico, W. I.....	29.99	30.02	+0.03	81.4	82.6	+ 1.2
Beirut, Turkey in Asia.....	29.78	29.79	+0.01	89.3	87.6	- 1.7
Mexico, Mexico.....	30.08	30.08	66.7
Havana, Cuba, W. I.....	29.99	30.02	+0.03	81.7	81.0	- 0.7
Paramaribo, D. Guiana, S. A.....	30.02	29.97	-0.05	81.5	79.8	- 1.7
York Factory, B. A.....	29.89	30.03	+0.14	48.2	42.6	- 5.6

In the United States, the temperature is normal, or below the normal, in all parts of the country, except in Tennessee, where it is 1° above. The greatest deficiencies occur in Dakota and in southern Texas.

In Canada, the temperature is slightly below the normal.

In Europe, the mean temperature of the air is generally above the normal in the northwestern part of the continent, the largest excesses occurring in the British Isles and in Scandinavia. In the southern and southwestern districts, the temperature is below the average, notably in Austria and in Italy.

In British India, the temperature is slightly below the normal; the highest mean, 96° 1 Fahr. (35° 6 Cent.), is reported from Lahore, and the lowest, 69° 8 Fahr. (21° 0 Cent.), at Belgaum, (elevation of station, 2,629 feet).

The following are some of the extreme monthly mean temperatures reported at isolated stations:

HIGHEST.	Degrees.	LOWEST.	Degrees.
Nukuss, Asia.....	88.7	York Factory, British America.....	42.6
Beirut, Asia.....	87.6	Tromsø, Norway.....	55.6
Tiflis, Russia.....	87.1	Stykkisholm, Iceland.....	56.1
Athens, Greece.....	85.6		

In the United States, the prevailing directions of the wind are: southerly and southeasterly from the ninetieth meridian, westward to the Pacific, except on the Pacific coast, where it is northerly. East of this meridian, the prevailing winds are as follows: easterly and northeasterly in the states lying south of the thirty-fifth parallel, northerly in Michigan and Wisconsin, and southwesterly in the region lying between the limits just named.

In Europe, the winds are northeasterly in the central and northwestern parts of the continent; in the southern peninsulas, they are generally southwesterly, and in Scandinavia southerly.

In Algeria, Morocco, and Tunis they are easterly and northerly.

In British India, the prevailing winds are westerly and southwesterly.

In China, they are easterly, and in Japan, they are southerly.

Over the north Atlantic ocean, the prevailing wind is southwesterly, from the coasts of the United States, eastward to the twenty-fifth meridian.

In the Bay of Biscay, and on the coasts of Spain and Portugal, they are northwesterly.

The rainfall of the month is in excess of the average in the interior and in the northeastern parts of the United States. It is below the average in all other districts, except in Florida, where a large excess occurs. In the Canadian maritime provinces, it is below the average. In other parts of Canada, there is a slight excess.

In northwestern Europe, the rainfall was generally below the average, while in Austria and the southeastern districts, it was considerably above the average, causing floods in many sections.

A noteworthy feature in the meteorology of the month is the occurrence of four West Indian hurricanes, and of four typhoons in the China sea. (See chart v. for August, 1880.)

Chart v. exhibits the paths of barometric depressions which have been traced from the daily international charts for the month of November, 1880.

The data are charted for each day of the month on the charts accompanying the "International Bulletin" for that day, and from these charts and from additional reports, are traced the movements of the centres of barometric minima.

Thirty-one of the principal storms that have occurred over the northern hemisphere have thus been traced. The following concerns the general distribution of these depressions:

Eleven appeared over the United States and Canada; of these, four, numbers iv., v., vii. and viii.,—have been traced from the interior of the country to the Atlantic coast, and thence eastward over the ocean to the European coasts.

Sixteen depressions are exhibited over Europe; thirteen of these traversed the northern and western parts of the continent, from southwest to northeast, while three depressions appeared in southern Europe, and moved in a course slightly south of east.

Three depressions are traced in eastern Asia, and one is shown over the Pacific ocean. This chart also exhibits the tracks of two typhoons that occurred over the China sea during the month; they were the last storms of that class during the typhoon season of 1880.

The following are brief descriptions of the storms first appearing in the United States and Canada:

I.—This area was probably a continuation of low area ix. of the October chart. The disturbance was central in northern Maine on October 31; it moved northeastward, and was over the Gulf of Saint Lawrence, November 1, the pressure at Father Point being 29.53 (750.0), wind nw., 38 miles, weather threatening. On the 2d, the depression passed north-northeastward and disappeared over Labrador.

II.—This depression developed apparently in Manitoba, and moved by a southeasterly course to Minnesota, where it was central, on the 2d. During the 3d and 4th, the disturbance continued its southeasterly movement, and on the 4th, was central

in Iowa. The course then changed to northeasterly, and the centre of disturbance moved over Lakes Michigan and Superior, causing rain and fresh easterly winds in Ontario. On the 5th, the depression finally disappeared north of Lake Superior.

III.—The centre of this disturbance became well-defined first in Kansas on the morning of the 3d. Moving thence northeastward, the depression united with low area ii., on the 4th.

IV.—This depression, which was of cyclonic origin, developed probably in the Gulf of Mexico. During the 5th, there was a marked decrease of pressure in the Gulf states, and by the 6th, an area of low pressure extended from Tennessee northward to the lake region, the lowest barometer being reported from Chattanooga, Tennessee, 29.70 (754.4), wind s., heavy rain. Moving rapidly northeastward, the centre of disturbance reached the Saint Lawrence valley on the 7th; it was attended by heavy rains and by southerly to easterly winds, changing afterward to strong westerly gales over the province of Ontario and the lakes. During the 7th and 8th, the storm-centre moved eastward, and on the latter date reached the Gulf of Saint Lawrence, causing strong westerly gales in the maritime provinces. By the 9th, the disturbance had moved to the eastward of Newfoundland, and was central probably near N. 50°, W. 54°. On the 10th, the disturbance, moving eastwardly, was central near N. 53°, W. 40°, the s. s. "Peruvian," in N. 53° 45', W. 44° 46', reporting wsw. wind of force 6, and squally weather; and the s. s. "Celtic," in N. 47°, W. 46°, strong wnw. gale, heavy sea. During the 11th and 12th, the storm was central near N. 53°, W. 25°; on the 12th the area of lowest pressure presented the form of an extended trough covering the ocean, from N. 45°, W. 35°, northeastward to the Norwegian coast. On the 13th, the low area appears to have divided into two parts. A well-defined storm-centre appeared off the northern coast of Norway, while an equally well-defined and deep depression formed at the southern limits of the trough. On the 13th, the storm-centre was probably near N. 52°, W. 25°; the bark "Kryolith," in N. 52° 50', W. 21° 45', reported barometer 28.99 (736.3), wind s., force 6, raining; the s. s. "Indiana," in N. 51° 18', W. 21° 06', barometer 29.07 (738.4), wind w., force 6, cloudy; bark "Von Berg," in N. 52° 30', W. 30° 00', fierce e., gale; the s. s. "Germanic," in N. 48° 37', W. 29° 08', barometer 29.00 (736.6), wind n., force 7; the ship "Gordon," in N. 48°, W. 22°, encountered fierce s. gale. During the day, the storm-centre moved toward the British coasts and on the 14th was over Ireland. This depression is hereafter described as low area xxii. of the storms appearing over Europe.

V.—This storm developed probably near the Alaskan coast, where there was a rapid barometric fall on the 4th and 5th, while a corresponding decrease of pressure occurred in Washington territory and in Manitoba, as the centre passed, by a southeasterly course, through the Saskatchewan valley. On the morning of the 8th, the centre was in northern Dakota, whence it moved southward to northern Texas. It was central there on the 9th. The course then changed to northeasterly, and, on the morning of the 10th, the depression was central in Iowa, the barometer at Keokuk reading 29.37 (746.0), a fall of .53 inch in twenty-four hours. On the 11th, the storm-centre was in northern Michigan, here it was attended by severe gales in the lake region and along the New England coast. Moving eastward from Michigan, the centre reached the Gulf of Saint Lawrence on the 12th, causing strong westerly gales along the valley of the Saint Lawrence and in the gulf. On the 13th, the storm moved over the Atlantic and was central probably southeast of Newfoundland, the s. s. "Anchoria," in N. 42°, W. 61°, reporting heavy w. gale with high sea. On the 14th, the s. s. "Köln," in N. 47° 19', W. 41° 35', reported barometer 29.71 (754.6), wind wsw., force 6 to 9, heavy rain and hail. During the 14th, the depression appears to have moved rapidly eastward, and on the 15th was central probably near N. 55°, W. 20°, the s. s. "Lamperts," in N. 53° 15', W. 19° 25', reporting barometer 29.10 (739.1), wind wsw., force 8, and

the s. s. "Illinois," in N. 51° 17', W. 19° 09', barometer 29.24 (742.7), wind ssw., force 6, overcast. During the 15th the disturbance moved, with increasing energy, toward the British coasts; it was central here on the 16th as a very severe storm. The subsequent course of this depression is hereafter described as low area xxiii. of this chart.

VI.—This area developed in Manitoba on the 14th, and, moving southeastward, was central in Minnesota on the morning of the 15th. After crossing Lake Michigan, the course changed to the northeast, and the disturbance moved with increasing pressure toward Ontario, where, on the 16th, it ceased to exist as a depression.

VII.—This depression formed in the Saint Lawrence valley on the 18th and passed rapidly across the Gulf, it appeared as a severe storm, southeast of Newfoundland on the 19th. The s. s. "Ethiopia," in N. 45° 16', W. 52° 24', reported barometer 29.59 (751.6), wind sw., force 6, squally; and the s. s. "Indiana," in N. 46° 00', W. 50° 20', 29.42 (747.3), wind wsw., force 7. On the morning of the 20th, the storm-centre was probably near N. 52°, W. 35°; the s. s. "Baltic," in N. 49° 55', W. 32° 05', reported barometer 29.40 (746.7), wind wsw., force 6, squally, and the s. s. "Jan Breydel," in N. 50° 20', W. 28° 28', encountered heavy sw. gales with high seas. The easterly movement of this depression appears to have been prevented by an area of high pressure, which occupied western Europe and the British Isles on the 21st. Owing to the presence of this high pressure, and to the existence of an area of relatively high pressure in the rear of the disturbance, steep gradients were formed over mid-ocean, and vessels from the region lying between the twenty-fifth and forty-fifth meridians and north of the fiftieth parallel, reported moderate to strong s., se. and w. gales, with high cross seas and squally weather. The s. s. "Pereire" reported stormy weather from the 23d to the 27th, the barometer rising and falling with remarkable rapidity. On the 22d, the pressure remained low over Iceland, and the area under consideration became merged probably in an extensive depression—low area viii.—which was rapidly spreading eastward over the ocean.

VIII.—This depression appeared first east of the Rocky mountains on the 18th. It was probably a continuation of the storm that developed in the Pacific ocean on the 15th, and which is hereafter given as low area xxviii. During the 19th and 20th, the disturbance moved northeastward rapidly, and was central over the eastern part of Lake Superior on the morning of the last-mentioned date. On the 21st, the storm-centre, passing through Ontario, reached the Gulf of Saint Lawrence; it was attended by severe westerly and southwesterly gales on the lakes. On the 22d, the depression, having crossed Newfoundland, was central probably near N. 52°, W. 48°; the s. s. "Roxburgh Castle," in N. 45°, W. 53°, reported increasing gale, terrific squalls, wind veering from s. to w.; the ship "Summer Cloud," in N. 47° 26', W. 47° 24', reported terrific gale; the s. s. "Ohio," in N. 47° 51', W. 46° 58', barometer 29.56 (750.8), wind wnw., force 8, cloudy. The storm-centre apparently moved north-northeastward, and on the 23d, was near N. 57°, W. 40°; the s. s. "State of Florida," in N. 55°, W. 24°, reported fresh sw. gale, squally; the s. s. "Cimbria," in N. 50°, W. 33°, heavy sw. to w. storm, high westerly sea; the s. s. "Ohio," in N. 49° 13', W. 39° 32', wind wnw., force 9, cloudy. On the 24th, the centre of lowest pressure was probably southeast of Greenland, at some distance from the coast, the pressure at Godthaab, Greenland, being 28.74 (730.0), wind nne., force 2; and at Stykkisholm, Iceland, the pressure was 28.78 (731.0), wind s., force 4. The s. s. "State of Florida," in N. 54°, W. 30°, encountered fresh wsw. gales and squally weather; the s. s. "Abyssinia," in N. 51°, W. 25°, strong w. gales, hard squalls and heavy sea; the s. s. "Cimbria," in N. 49°, W. 34°, hurricane-like storm, wind w. to s., tremendous sea. On that day the isobar of 30.00 (762.0) covered the fortieth parallel, showing a gradient corresponding to 1.2 inches to 1,000 miles. Numerous reports from vessels in mid-ocean, from the 23d to the

26th, agree as to the stormy character of the weather over the Atlantic during these days; hurricane-like winds prevailed mostly from southwest and northwest; precipitation was heavy and frequent, and occasionally in the form of hail and snow. On the 25th, the centre of disturbance was south of Iceland, the gradients having increased in the eastern quadrants; strong southwest winds and rain prevailed over the northern parts of the British Isles, and in Scandinavia, the winds were southerly and southeasterly. During the 25th, the depression moved in a southeasterly course, and, on the 26th, was shown over the Hebrides, lowest reported pressure, 28.35 (720.1), at Monach light-house, wind sw., force 8. The barometric gradient had rapidly increased over the northern part of the British Isles, and strong southwesterly gales, with higher temperature and with general rains, prevailed over those islands. On the 27th, the disturbance was central, with increasing pressure, off the coast of Norway, and the barometer rose rapidly over the British Isles, and over northern France and Germany; this rise was accompanied by a slight fall in temperature, but by no general change in the direction of the wind. On the 28th, the depression, moving northeastward, disappeared finally to the north of the White sea. The remains of this depression, probably reinforced by low area xxvii., continued with more or less violence over the Atlantic until the morning of the 29th.

IX.—This depression developed probably in Manitoba on the 27th, and moving eastward, was central near Moose Factory on the 28th, barometer 29.76 (755.9), being a fall of .30 inch in twenty-four hours. On the 29th, the centre passed north of the stations of observation, and on the 30th, it united probably with low area x.

X.—This disturbance formed apparently off the New England coast on the 29th, and was first observed by the s. s. "Pennsylvania," in N. 41° 06', W. 64° 33', barometer 29.55 (750.6), wind nw., force 5, overcast. The s. s. "Britannic," in N. 41° 16', W. 61° 09', reported barometer 29.88 (758.9), wind sse., force 6, raining. On the 30th, the depression was central near N. 45°, W. 45°, the s. s. "Leipzig," in N. 45° 55', W. 43° 03', reporting barometer 29.36 (745.7), wind ssw., force 4.; s. s. "Scythia," in N. 43° 36', W. 51° 46', barometer 29.41 (737.0), wind w., force 4.

XI.—This depression developed probably in the Saskatchewan valley on the 29th, and on the 30th, appeared in Montana. The subsequent course of this depression will be described in the next issue of this REVIEW.

Of the storms appearing over Europe, the following descriptions are given:

XII.—At the close of October, an area of low-pressure occupied northern Europe, and on November 1, the centre of lowest pressure appeared to be over the White sea; barometer at Archangel 29.25 (742.9), wind ese. On the 2d, the depression disappeared to the northward over the Arctic ocean.

XIII.—This depression appeared on the 2d, with its centre near the Gulf of Finland, causing strong northwest winds over Sweden and the Baltic sea. On the 3d, the disturbance moved northeastward, attended by light snow-falls, and finally disappeared over the White sea.

XIV.—This disturbance appeared on the Bay of Biscay on the 2d, and moved eastward, causing a marked barometric fall over France. On the 3d, the storm-centre was over the Mediterranean, off the eastern coast of Spain. Slightly lower temperatures, with northeast winds and cloudy weather, prevailed over France, while in Spain, the wind was northwest, with cloudy and rainy weather. On the 2d, a terrific hurricane passed over the island of Cyprus, causing much destruction of property. On the 4th, the disturbance finally disappeared over Italy, attended by a rapid increase of pressure in its rear.

XV.—This depression appeared off the northwestern coast of Norway on the 3d. It was attended by higher temperature, and by light rain or snow. On the 4th, the centre was northeast of the Gulf of Bothnia. An area of high barometer at this time occupied the British Isles, Denmark, and central Europe,

and a somewhat steep barometric gradient was formed over the Baltic, causing strong southwesterly gales. On the 5th, the disturbance passed eastward and disappeared north of the White sea.

XVI.—On the morning of the 6th, a somewhat deep depression, 29.20 (741.1), appeared off the Norwegian coast, causing a decrease of pressure over the northern parts of the British Isles. It was attended by a general rise in temperature and by rainy weather, with brisk to strong south to west winds. On the 7th, the disturbance moved eastward and was central in northern Sweden. It was attended by rain and snow, and by a considerable rise in temperature. On the 8th, the centre was probably in Finland. The course appears to have then changed to the southeast, and the depression is shown near, and to the east of the Gulf of Finland on the 9th, with strong westerly and northwesterly winds on the east and south of the centre. On the 10th, the disturbance disappeared north of Kansas.

XVII.—This area appeared north of Scotland on the 9th, causing a rapid decrease of pressure over the northern part of Great Britain. A steep barometric gradient was formed over the islands, and strong westerly and southwesterly gales, accompanied by rain in the northern sections of the country, prevailed. The depression moved by a southeasterly course over the North sea, and on the 10th, was central in Denmark. On the 11th, the depression filled up, in northeastern Germany, an area of high pressure, 30.20 (767.1), having then spread over central Europe.

XVIII.—This slight depression appeared near the western shore of the Black Sea on the 10th, and was probably an offshoot of low area xvii., just described. Rain and snow fell in the Black sea districts during the 10th and 11th, and on the 11th, the disturbance filled up near the eastern limits of the Black sea.

XIX.—This was a slight disturbance, which appeared over the Mediterranean on the 12th, and, moving eastward, disappeared on the following day.

XX.—An area of low-pressure appeared near Iceland on the 11th, the barometer having fallen .44 inch at Stykkisholm, wind changing to southeasterly, with snow. A decrease of pressure set in over Scotland on the 11th, and on the 12th, the disturbance presented the form of an extended trough resting off the northwestern coasts of the British Isles and Norway. On the 13th, the depression passed northeastward and merged probably with low area xxi.

XXI.—On the morning of the 13th, an extensive area of low barometer occupied northwestern Europe; the region of lowest pressure was situated in northern Scandinavia, while another deep depression was over the Atlantic ocean, between N. 50° and 60° and W. 20° and 30°. Strong southwesterly gales, accompanied by higher temperatures and rainy weather, prevailed over this district. On the 14th, the centre moved apparently southeastward, and was in Finland; the course then changed to northeasterly, and the depression moved over the White sea, finally disappearing, on the 16th, over the Arctic ocean.

XXII.—This depression is a continuation of low area iv. of the present chart, and is traced from the Gulf of Mexico across the Atlantic to the European coasts. Central on the morning of the 13th, near N. 52°, W. 25°, the disturbance moved eastward, and on the 14th, was central in Ireland; it was accompanied by strong southwesterly winds and rain. On the 15th, the disturbance passed over the North sea, and, on the 16th, was central in southern Scandinavia. It then moved northeastward and became merged probably in an extensive and deep depression occupying Finland and northern Russia. The maximum temperatures of the month occurred in western Europe in connection with this and the preceding area.

XXIII.—This depression is a continuation of the storm traced across the Atlantic as low area v. It appeared off the coast of Ireland, when low area xxii. was crossing the North sea, and, on the 16th, was central over the Irish Channel, attended by a

general rise in temperature, and by rainy weather. Strong northerly winds prevailed over Ireland. In France and in the southern part of England, southwesterly gales occurred, while to the east and north of the centre the winds were generally easterly. On the 17th, the centre of disturbance reached southern Scandinavia, the winds changing to fresh northwesterly over the British Isles, and to strong southwesterly along the shores of the Baltic and the northwestern coasts of Germany. On the 18th, a rapid increase of pressure occurred, and the storm-centre, moving northeastward, on the 19th, crossed the Gulf of Bothnia into Finland. On the 20th, the centre of disturbance appeared near to, but east of, the Gulf of Finland, and on that day united with low area xxiv., which had passed northeastward through northwestern Europe as a somewhat severe storm.

XXIV.—This storm first appeared as a deep depression southwest of the British Isles on the 18th; the s. s. "Nederland," in N. $49^{\circ} 08'$, W. $12^{\circ} 00'$, reported barometer 28.92 (734.6), wind ne., force 6, stormy. At Scilly, the barometer read 28.70 (729.0), wind ne., heavy gale; and southwesterly gales prevailed on the Spanish coasts and over the Bay of Biscay. The depression moved northeastward, and on the 19th, was central, with increased energy, in Germany, near the mouth of the Elbe, causing strong southwesterly to northwesterly gales, and accompanied by rain and snow. During the 19th, the storm moved rapidly northeastward and crossed the Baltic, attended by strong northerly gales and by rain and snow. On the 20th, the centre appeared in northwestern Russia, where it united with the preceding depression (low area xxiii.). During the 21st and 22d, the disturbance moved eastward, with increasing pressure at the centre, and disappeared finally in the neighborhood of the Ural mountains on the 22d. This storm was very severe in northern France; several houses were unroofed, and numerous vessels in the ports of Havre and Brest sustained more or less damage. At various places in northern Germany, the precipitation accompanying the storm caused much injury to farming interests; several houses were unroofed by the high winds.

XXV.—This depression was slight, 29.80 (718.9). It appeared north of Scotland on the 19th, but was quickly dissipated on the following day by an area of high-pressure, 30.20 (767.1), which covered the British Isles.

XXVI.—This depression appeared in northwestern Russia on the 24th, and, moving eastward, disappeared on the following day in the valley of the Obi.

From the 23d to the 27th, an extensive area of low-pressure covered western Europe, and is described in connection with low area viii.

XXVII.—This area appeared on the 28th, as a deep depression southeast of Iceland, and, moving northeastward, was central off northern Norway on the 29th. On these days there was a decrease of pressure over Ireland and Scotland, which was accompanied by fresh to strong southwesterly winds, and by rain there, and in Scandinavia. On the 30th, the disturbance was central near the White sea, and was attended by snow and strong westerly winds over the Baltic and the Gulf of Bothnia.

XXVIII.—This depression was observed in the Pacific ocean on the 15th, H. M. S. "Gannet," in N. 34° , W. 147° , reporting barometer 29.62 (752.3) wind ese., force 7 to 9, raining. On the 16th, the ship "Thirlmere," in N. $39^{\circ} 15'$, W. $133^{\circ} 03'$, encountered strong ne. gale, lasting twelve hours, and the ship "Johanna Heinrich" was abandoned, when about two hundred and fifty miles from San Francisco, during a gale that occurred on the 16th, and increased to a hurricane on the 17th. On the 17th, the centre reached the continent, and, moving eastward during the 18th, was united probably with low area viii. on the 19th.

The following descriptions are given of the storms appearing over eastern Asia:

XXIX.—This depression appeared near Peking on the 2d, the barometer at that station reading 29.74 (755.3), the wind hav-

ing changed from nw. thirty-one miles per hour to calm, and on the following day to northeasterly. The disturbance moved across the Gulf of Pe-Chi-Li and the peninsula of Corea as a severe storm, the wind at Cape Shan-Tung reaching a velocity of sixty miles, nw. On the 3d, the depression disappeared over the Sea of Japan.

XXX.—This storm probably developed in Tartary on the 6th, a severe snow storm occurring at Vladivostok on that day. On the 7th, the disturbance was over the Sea of Japan, to the northwest of Nippon; on the 8th, the centre was in N. 36° , E. 145° , the s. s. "City of Peking," in N. $32^{\circ} 54'$, E. $144^{\circ} 11'$, reporting barometer 29.94 (760.5), a fall of .14 inch, wind wnw., force 6. On the 9th, the area disappeared in the Pacific.

XXXI.—This depression occurred in the Gulf of Pe-Chi-Li, on the 25th, and was extremely violent during its prevalence. At Cape Shan-Tung, a northerly wind of force 10 was reported, accompanied by a heavy snow storm. Moving northeasterly over the Japan sea, the disturbance was central off Nippon on the 26th, the barometer at Tokio 29.59 (751.6), wind sw. On the 27th, the centre passed the northern part of Nippon, the barometer at Sirija-Saki light-house, reading 29.09 (737.0), wind se. to nw. and n. On the same day, the s. s. "Belgie," in N. $36^{\circ} 26'$, E. $146^{\circ} 41'$, reported barometer 29.46 (748.3), wind w., force 6, high sea; the depression then moved north-eastward, and probably reached the Aleutian Islands on the 29th. The Signal Service observer at Attu Island (N. $52^{\circ} 28'$, E. $172^{\circ} 30'$), reported: 29th, barometer (not reduced to sea-level) 28.68 (728.5), wind e., fifty-seven miles, raining; and, on the 30th, barometer 28.87 (733.3), wind se., forty-six miles, heavy rain.

The following descriptions of the typhoons of November, 1880, are taken from the "Bulletin Mensuel," published by Mr. Marc Dechevens, of Zi-Ka-Wei, China:

1. This was the last typhoon of the season of 1880 that occurred in the China sea, and was also the most southerly. The s. s. "Ancona" reported: 7th, in N. $8^{\circ} 30'$, E. $110^{\circ} 00'$, strong ene. wind, high sea; 8th, barometer 30.12 (765.0), wind blowing in squalls and accompanied by heavy rain; on the 9th, the wind was northerly and increasing in force; in N. $11^{\circ} 07'$, E. $112^{\circ} 49'$, the barometer began to fall and the wind increased. The course was changed and the vessel's head was put southward; at 4 p. m., the wind shifted to northwesterly; it was accompanied by torrents of rain; at 5 p. m., the barometer read 29.70 (754.4), falling, and the wind again shifted to n. and ne.; at 8 p. m., the barometer read 29.60 (751.8), wind ene., the centre passing south of the vessel; at 9 p. m., the barometer began to rise, with clearing weather, and the vessel resumed her course.

During the 12th, 13th, and 14th, the typhoon passed into the Gulf of Siam, where the American bark "Coringa," was wrecked on the 14th. The "Coringa" reported: left Bangkok on the 11th, with strong ne. winds, which continued until the 13th, when it increased to a strong gale. The vessel shipped large quantities of water and sprung a leak, and the bulwarks and boats were lost. The gale continued until the 15th, when, at 4 p. m., wind ene., the vessel was driven ashore near Cape Patani.

2. This typhoon occurred over the ocean at a considerable distance from the coasts. It was first observed in about N. 23° and between E. 130° and 150° . The German ship "Gesine Brons," reported: 15th, barometer 28.88 (733.5), wind sse, veering to sw. and nw.

The typhoons of the season of 1880 ended with the disturbance above mentioned. Thirteen typhoons were observed during the period between July 13th and November 15th, an average of one typhoon every ten days.

TEMPERATURE OF THE AIR.

The distribution of mean temperature, over the United States and Canada, for the month of October, 1882, is exhibited on chart ii., by the dotted isothermal lines. The table of mean comparative temperatures in the lower left-hand corner of the chart, shows the average temperature for the month in the